

Yashwantrao Chavan Warana Mahavidyalaya, Warananagar
Department of Chemistry

Course Outcomes (CO), Program outcomes (PO), and Program Specific Outcomes (PSO)

A) U.G. Course / Programme 2017-18 and 2018-2019

Title of Course	Course Outcomes (Statements)
B.Sc.I Semester-I Paper- I Inorganic Chemistry	Knowledge Domain: 1.To know about the shape of s,p and d orbital
	2. To know the periodic properties of element.
	3. To know the energy in the ionic bond formation.
	4. To acquire knowledge about molecular orbital theory.
	5. to know the molecular orbital diagram for homonuclear diatomic molecule.
	Skill Domain
	1.To develop skill, to filling electrons in various orbitals by using Aufbau'principle, Hunds rule and pauli'exclusion principle
	2. To develop skill, to calculate lattice energy.
	3. To develop skill, to find the shape and geometry of the orbitals.
	4. To develop skill, to calculate bond order of molecule.
Title of Course	Course Outcomes (Statements)
B.Sc.I Semester-II Paper No. II Organic Chemistry	Knowledge Domain
	1. To know the three diamentional structure and symmetry
	2. Learn different nomenclature system.
	3.to understand the nature , reactivity and catalytic action of aliphatic cyclic molecule.
	4.learn necessary physiological conditions regarding cyclic molecule.
	Skill Domain
	1 To develop skill, in reactivity of aromatic compound..
	2. To develop skill, to understand basic concept of organic reaction mechanism, intermediate and stability.
	3. To develop skill, to understand different nomenclature system.
4. To develop skill, in differentiation aromatic and antiromatic compound.	
Title of Course	Course Outcomes (Statements)
B.Sc.I Semester- II Paper No. III Physical chemistry	Knowledge Domain
	1.To know the idea about natural process and artificial process.
	2. To know the work of engine.
	3.to acqure the knowledge about free energy change in chemical reaction.
	4. To know the difference between ideal and non ideal gases.
	5. . To know the rate of reaction and rate of reaction.
	Skill Domain
	1.To develop problem solving skill in student.
	2. To develop skill, to calculate the efficiency of heat engine.
	3. To develop skill, to find the rate of reaction.
4. To develop skill, to imagination of gases behavior.	

2017-18 and 2018-19

Title of Course	Course Outcomes (Statements)
------------------------	-------------------------------------

B.Sc.I Semester- II Paper -IV Analytical Chemistry	Knowledge Domain
	1.to aquire the basic Knowledge about structure , bonding, and preparation of hydrocarbons.
	2.Explaining theories of chemical bonding and moleculer structure .
	3.To aquire fundamental knowledge Newtonain mechanism.
	4. To aquire the knowledge of basic idea of analysis.
	5. Illustrate the preperative methods of simple structure.
	Skill Domain
	1. . To develop skill, for sampling about solid liquid and gases.
	2. . To develop skill, to use of paper chromatography and loading sample on paper sheet.
	3. . To develop skill, to calculate the PH of solution using the PH meter.
4. . To develop skill, to find the hardness of water by any water sample.	
Title of Course	Course Outcomes (Statements)
B.Sc.- .II Semester- III Paper- V Physical Chemistry	Knowledge Domain: To Enable the student
	1. To know the type of conductors and their conductivity
	2. To know the idea about conductometric titration
	3. To know idea about physical and chemical adsorption
	4. To know the difference between adsorption and absorption
	Skill Domain: To Enable the student
	1. to develop skill to calculate the equivalent and molar conductivity
	2. to develop skill to calculate surface tension
	3. to develop skill for detection and measurement of nuclear radiation
	4.to develop skill to distinguish the type of nuclear radiation
b) U.G. Course / Programme 2017-18 and 2018-19	
Title of Course	Course Outcomes (Statements)
B.Sc.- .II Semester- III Paper - VI Industrial Chemistry	Knowledge Domain
	1.To know idea about a raw material for the chemical industry
	2.To know various separation methods in industrial chemistry
	3.To aquire knowledge about paper industry
	4.To know the idea about corrosion and electroplating
	5.To know the various chemical processes aboutr size reduction and size enlargement
	Skill Domain
	1. To develop the skill for handling various distilation flask
	2.to develop skill to prevent metal corrosion
	3.To develop skill to calculate the normality,molarity,molality,etc of solution
Title of Course	Course Outcomes (Statements)
B.Sc.- .II Semester- IV Paper - VII Inorganic Chemistry	Knowledge Domain
	1.To know the position of p-block elements in periodic table
	2.To know the various properties of d-block elements
	3.To know the various cordiation compounds and their nomenclature
	4.To know the position of p&d-block elements in periodic table
	5.To know the idea about theoriotical principle involved in qualitative

	.analysis
	Skill Domain
	1.to develop skill to calculate crystal field stabilization energy
	2.to develop skill to identify acidic and basic radicals
	3.to develop skill to take various radiacals sopt tests
	4.to develop skill to calculate cordiation number of metal complexes

Title of Course	Course Outcomes (Statements)
B.Sc.- .II Semester- IV Paper – VIII Organic Chemistry	Knowledge Domain
	1.To know about 3-D study of molecule
	2.To know abut carbonyl compounds their nomenclature,structure and reaction mechanism
	3. To know in detail study of carbohydrates like glucose and fructose
	4.To know various carboxylic acids and their derivatives
	5.To know adea about classification ,nomenclature,structure of amines and diazonium salt
	Skill Domain
	1.to develop skill in preparation of derivatives of carboxylic acids
	2. to develop reaction mechanism solving skill in students
	3.to develop skill to understand 3-D structure of molecule
	4.to develop organic problem solving skill in students

Title of Course	Course Outcomes (Statements)
B.Sc.III Semester- V Paper-IX Inorganic Chemistry	Knowledge Domain
	1.To study of HSAB concepts and its applications
	2. To open new idea of superconducting material
	3.To study of alkyl and aryl compounds
	4.To to know nature of bonding simple metal carbonyl compounds
	Skill Domain
	1.to develop skill to count electrons in inorganic compounds
	2.to develop problem solving skill in students

Title of Course	Course Outcomes (Statements)
B.Sc.III Semester- V Paper-X Organic Chemistry	Knowledge Domain- To enable the students
	1.To promote understanding of basic facts and concepts in spectroscopic techniques
	2. To inquire of new knowledge of chemistry and developments therein
	3.To makes students capable of studying analytical techniques in academic course
	4.To expose and to develop interests in the field of chemistry
	Skill Domain
	1.to develop problem solving skills in students
	2.to develop skills required in chemistry such as the proper handling of apparatus,instruments,and chemicals

B.Sc.III Semester-V PaperNo.XI Physical Chemistry	Knowledge Domain: To enable the students
	1.To understand photochemical reactions
	2.To know the type of solutions
	3.To understand types of electrode and cells
	4.To know about applications of emf
	Skill Domain
	1.to develop skill to handling the various electrode
2.to develop skill to calculate energy of atom	
B.Sc.III Semester-V PaperNo.XII Analytical Chemistry	Knowledge Domain To enable the students
	1.To know the various acid base titrations
	2.To know the various physical nature of precipitation
	3.To know the idea about gravimetric analysis
	4.To know the idea about various chromatographic technique
	Skill Domain
	1.to develop skill to handling the potentiometer
2. .to develop skill to maintain optimum condition	
3. .to develop skill to handling spectrophotometer	
B.Sc.III Semester-VI PaperNo.XIII Inorganic Chemistry	Knowledge Domain To enable the learners
	1.To make awareness about inert and labile complexes
	2.To know electronic structure and synthesis of transuranic element
	3.To extention of coordination chemistry,explaining some facts about stability of complexes.
	4.To know mechanism and substitution in metal complexes,trans effects and its theories.
	Skill Domain
	1.to develop skill in electronic structure and synthesis of transuranic elements
2.to develop problem solving skill in students	
3.to develop skill in thermodynamic and chinetic aspects of metal complexes	
B.Sc.III Semester-VI PaperNo.XIV Organic Chemistry	Knowledge Domain: To enable the students
	1.To make students capable of studying chemistry in academic courses
	2.To expose the students to different processes used in industries
	3.To inquire the new knowledge of chemistry and development therein
	4.To promote understanding of basic facts and concepts in chemistry
	Skill Domain:
	1. to develop problem solving skill in students
2. to develop skills required in chemistry such as the proper handling of apparatus,instruments,and chemicals	
B.Sc.III Semester-VI PaperNo.XV Physical Chemistry	Knowledge Domain :To enable the students
	1.To know the laws of crystallograghy
	2.To know about adsorption isotherm
	3.To understand solid –liquid phase equilibrium
	4.To understand the use of functions of equilibria and spontaneity
	Skill Domain:
	1.to develop the skill to find the phase equilibria of any compound
2.to develop skill to find any crystal structure	
3.to develop skill to solve the problem based on thermodynamic first law	
4.to develop skill to find chain of radioactive elements	

Title of Course	Course Outcomes (Statements)
B.Sc.III Semester-VI PaperNo.XVI Industrial Chemistry	Knowledge Domain
	1.To know understanding the whole process of manufacture of sugar.
	2.To know understanding and learning the classification synthesis and applications of various polymers
	3.To know understanding the petroleum industry fuel
	4.To know understanding of physicochemical principle of production of ammonia,sulphuric acid etc...
	Skill Domain
	1.to develop problem solving skill in students
	2.to develop skill required in chemistry such as the handling of apparatus, instrument and chemicals.
	3.to develop skill manufacture of ethyl alcohol from molasses by fermentation
	4.to develop skill to understand Hyber's,Ostwald's and solvey process

B) P.G. Course / Programme - PG Course M.Sc –I Sem- I

Title of course	Outcomes of course (statements)
Inorganic chemistry-I	<p>Knowledge Domain</p> <ol style="list-style-type: none"> 1. To acquire the knowledge of basic of chemistry of transition elements 2. To acquire the knowledge of basic of metal carbonyls and related compounds 3. To understand concept of organometallic chemistry 4. To understand the concept of metal-ligand equilibrium in solution 5. To acquire the knowledge of nuclear and radio-chemistry <p>Skill Domain</p> <ol style="list-style-type: none"> 1. To develop the skill of identify the transition element and their properties 2. To develop the skill of identification of organometallic compound and their various reaction 3. To acquire the skill of thermodynamic and stability of metal complexes 4. To develop the skill of identify reaction of nuclear and radioactive compound and their application
Organic chemistry-I	<p>Knowledge Domain</p> <ol style="list-style-type: none"> 1. To classify the various type of aliphatic and nucleophilic substitution reaction 2. To understand the concept of aromaticity in benzoate and non benzoate compound 3. To understand the mechanism of various name reaction 4. To acquire knowledge of stereochemistry optical activity and racemic modification <p>Skill Domain</p> <ol style="list-style-type: none"> 1. To develop the skill of aromaticity of benzoate

	<p>and nonbenzoate compound</p> <ol style="list-style-type: none"> To develop the skill of aromatic electrophilic substitution reaction To develop the skill of application of name reaction To develop the skill of identification of R and S nomenclature and reactivity and stability
Physical chemistry- I	<p>Knowledge Domain</p> <ol style="list-style-type: none"> To acquire the knowledge of various concept in thermodynamics To understand the concept of statistical thermodynamics To acquire the knowledge of collids and surface phenomena To acquire detail knowledge of macromolecules <p>Skill Domain</p> <ol style="list-style-type: none"> To develop the skill of various application thermodynamics To acquire the skill of determination of energy using statistical thermodynamics To develop the skill of determination of surface area and identification of colloidal system To develop the skill of method for synthesis of macromolecules
Analytical chemistry-I	<p>Knowledge Domain</p> <ol style="list-style-type: none"> To acquire the knowledge errors and sampling To acquire the knowledge of fundamental of quantitative analysis To acquire the knowledge of various chromatographic methods To understand the concept of different electro analytical technique <p>Skill Domain</p> <ol style="list-style-type: none"> To develop the skill of determination of errors and methods of sampling To develop the skill of various fundamental of quantitative analysis To develop the skill of applicative use of various chromatographic methods in analysis To acquire the skill of using electroanalytical technique for the analysis of various metal

**PG COURSE M.Sc -I Analytical Chemistry
Sem-I 2018-19**

Title of course	Outcomes of course (statements)
Inorganic chemistry 1	<p>Knowledge Domain</p> <ol style="list-style-type: none"> To acquire the knowledge of basic of chemistry of transition elements To acquire the knowledge of basic of metal carbonyls and related compounds

	8. To understand concept of organometallic chemistry 9. To understand the concept of metal-ligand equilibrium in solution To acquire the knowledge of nuclear and radio-chemistry
	Skill Domain 5. To develop the skill of identify the transition element and their properties 6. To develop the skill of identification of organometallic compound and their various reaction 7. To acquire the skill of thermodynamic and stability of metal complexes 8. To develop the skill of identify reaction of nuclear and radioactive compound and their application
Organic chemistry 1st	Knowledge Domain 5. To classify the various type of aliphatic and nucleophilic substitution reaction 6. To understand the concept of aromaticity in benzoate and non benzoate compound 7. To understand the mechanism of various name reaction 8. To acquire knowledge of stereochemistry optical activity and racemic modification
	Skill Domain 1. To develop the skill of aromaticity of benzoate and nonbenzoate compound 2. To develop the skill of aromatic electrophilic substitution reaction 3. To develop the skill of application of name reaction To develop the skill of identification of R and S nomenclature and reactivity and stability
Physical chemistry 1st	Knowledge Domain 5. To acquire the knowledge of various concept in thermodynamics 6. To understand the concept of statistical thermodynamics 7. To acquire the knowledge of collids and surface phenomena 8. To acquire detail knowledge of macromolecules
	Skill Domain 1. To develop the skill of various application thermodynamics 2. To acquire the skill of determination of energy using statistical thermodynamics 3. To develop the skill of determination of surface area and identification of colloidal system To develop the skill of method for synthesis of macromolecules
Analytical chemistry 1st	Knowledge Domain

	<ol style="list-style-type: none"> 5. To acquire the knowledge errors and sampling 6. To acquire the knowledge of fundamental of quantitative analysis 7. To acquire the knowledge of various chromatographic methods 4 To understand the concept of different electro analytical technique
	<p>Skill Domain</p> <ol style="list-style-type: none"> 1 To develop the skill of determination of errors and methods of sampling 2 To develop the skill of various fundamental of quantitative analysis 3 To develop the skill of applicative use of various chromatographic methods in analysis 4 To acquire the skill of using electroanalytical technique for the analysis of various metal

PG COURSE M.Sc -I Analytical Chemistry Sem-II 2018-19

Title of Course	Course of Outcomes(Statements)
Inorganic chemistry –II Paper-V	<p>knowledge domain</p> <ol style="list-style-type: none"> 1) To acquire the knowledge non transition element and their compound. 2) To acquire the knowledge of geometry shape and structure of coordination compound. 3) To understand the concept of F-block element . 1) To acquire the knowledge of solid state and bioinorganic chemistry.
	<p>Skill Domain</p> <ol style="list-style-type: none"> 1) To develop the skill of identification of structural information of non transition element. 2) To develop the skill of identification of stereochemistry and bonding main group compound. 3) To enable the skill of determine the physical and chemical priorities of F-block element 4) To develop the skill of various of crystals.
Organic chemistry-II Paper-VI	<p>knowledge domain</p> <ol style="list-style-type: none"> 1) To understand the mechanism of various arrangement and application. 2) To acquire the knowledge of photochemical reaction. 3) To acquire the knowledge of reduction and protection of functional group. 4) To understand the concept of organometallic compound.
	<p>Skill Domain</p> <ol style="list-style-type: none"> 1) To develop the skill of application of various rearrangement reaction . 2) To develop the skill of isomerisation and photochemical reaction. 3) To enable the skill of practical application of oxidation and hydroboration. 4) To enable the skill of applicative knowledge of organometallic compound.
Physical chemistry-II Paper -VII	<p>knowledge domain</p> <ol style="list-style-type: none"> 1) To acquire the knowledge of quantum chemistry. 2) To understand the concept of photochemistry.

	<ol style="list-style-type: none"> 3) To understand the concept and application of electrochemisrty. 4) To acquire the knowledge chemical kinetics and catalysis.
	Skill Domain <ol style="list-style-type: none"> 1) To develop the skill of application of quantum chemistry. 2) To enable the skill of photoradiation and types of photochemistry. 3) To develop the skill of practical application of electrochemistry. 4) To enable the skill of use of chemical kinetics in various processes.
Analytical chemistry-II Paper-VIII	knowledge domain <ol style="list-style-type: none"> 1) To acquire the knowledge of UV-Visible , IR spectroscopy. 2) To understand the concept of NMR and Mass spectroscopy. 3) To understand the different method of thermal analysis. 4) To acquire the knowledge of various atomic spectroscopy .
	Skill Domain <ol style="list-style-type: none"> 1) To develop the skill of determination of functional group. 2) To enable the skill of determination of element of the structure. 3) To enable the skill of various different method of thermal analysis . 4) To develop the skill of atomic spectroscopy for the analysis of various method.

PG COURSE M.Sc II Analytical Chemistry; Sem-IV 2018-19

^Title of Course	Course of Outcomes(Statements)
Modern Separation Method in analysis Paper -XIII	Knowledge Domain <ol style="list-style-type: none"> 1) To acquire the knowledge of advance gas chromatography Technique. 2) To acquire the knowledge of advance liquid chromatography Technique. 3) To understand the basic principle and application of ion chromatography. 4) To understand the Knowledge of extractive chromatographic separation and modern technique of extraction.
	Skill Domain <ol style="list-style-type: none"> 1) To develop the skill of advance gas chromatography in analysis. 2) To enable the skill of advance Liquid chromatography in analysis. 3) To develop the skill of applicative idea of ion chromatography. 4) To enable the skill of Modern extraction and separation technique and its application based on chromatography.
Organic Industrial Analysis Paper -XIV	Knowledge Domain <ol style="list-style-type: none"> 1) To acquire the knowledge of industrial analysis of oil, fat, soap and detergent. 2) To understand the estimation of food and food additive analysis. 3) To acquire the knowledge of analysis of cosmetic product. 4) To understand the method of paint, pigment and petroleum product.
	Skill Domain <ol style="list-style-type: none"> 1) To develop the industrial skill of soap manufacture and estimation. 2) To enable the idea for preservation of food and their application. 3) To enable the skill of future scope of cosmetic product and its role in analytical chemistry. 4) To develop the skill of analysis of paint and pigments.
Advanced method in	Knowledge Domain <ol style="list-style-type: none"> 1) To understand the knowledge of fluorescence and phosphorescence

chemical analysis Paper -XV	<p>spectrophotometry.</p> <p>2) To acquire the basic and theoretical knowledge of kinetic method of analysis.</p> <p>3) To know the knowledge of electron spectroscopy based on photon.</p> <p>4) To know the knowledge of X-ray generation and origin.</p>
	<p>Skill Domain</p> <p>1) To develop the skill of application of fluorescence and phosphorescence spectrophotometry.</p> <p>2) To develop the skill of application and enzyme catalyzed reaction of chemical kinetics.</p> <p>3) To enable the skill of instrumentation of photoelectron spectroscopy and auger electron spectroscopy.</p> <p>4) To enable the skill of method of X-Ray spectroscopy and application.</p>
Industrial analytical chemistry Paper -XVI	<p>Knowledge Domain</p> <p>1) To know the various method of spectrochemical analysis.</p> <p>2) To acquire the knowledge of various metal and its application.</p> <p>3) To acquire the knowledge of soil and fertilizer analysis.</p> <p>4) To know the various method of analysis of commercial material.</p>
	<p>Skill Domain</p> <p>1) To develop the industrial skill of spectrochemical analysis and its application.</p> <p>2) To enable the idea of estimation of metal and alloy.</p> <p>3) To develop the skill of soil analysis and determination of pH.</p> <p>4) To enable the skill of paint and lubricant analysis.</p>

PG COURSE M.Sc -II Analytical Chemistry; Sem-III 2018-19

Title of Course	Course of Outcomes(Statements)
Advance Analytical Method Paper -IX	<p>knowledge domain</p> <p>2) To acquire the advance knowledge of mass spectroscopy .</p> <p>2)To acquire the knowledge of nanotechnology and nanochemistry.</p> <p>3) To know the idea of instrumentation techniques.</p> <p>4) To acquire the knowledge of instrumentation in advance techniques.</p>
	<p>Skill Domain</p> <p>1) To enable the knowledge of advance mass spectroscopy .</p> <p>2) To develop the skill of research based on nanotechnology .</p> <p>3) To develop the skill of instrumentation techniques.</p> <p>4) To understand the main difference between old instrumentation techniques and advance instrumentation techniques</p>
Organo analytical technique Paper -X	<p>knowledge domain</p> <p>1) To understand the various concept of hyphenated techniques .</p> <p>2) To acquire the knowledge of drug analysis and vitamins analysis.</p> <p>3) To acquire the knowledge of clinical analysis and body fluid analysis .</p> <p>4) To acquire the knowledge of pesticide analysis and forensic analysis.</p>
	<p>Skill Domain</p>

	<ol style="list-style-type: none"> 1) To develop the knowledge of structural determination of spectroscopic techniques and its application . 2) To develop the skill of drug analysis and vitamins analysis. 3) To develop the skill of clinical analysis and body fluid analysis. 4) To develop the skill of pesticide analysis and forensic analysis.
Electroanalytical Techniques in chemical analysis Paper -XI	<p>knowledge domain</p> <ol style="list-style-type: none"> 1) To understand the concept of voltametry and its types. 2) To acquire the knowledge of electrophoresis. 3) To understand the method of partical analysis . 4) To acquire the terminology of ion selective electrode.
	<p>Skill Domain</p> <ol style="list-style-type: none"> 1) To develop the skill of type of voltametry and instrumentation . 2) To enable the skill of electrophoresis in analytical chemistry and research . 3) To develop the skill of LASER lights scattering with instrumentation and application. 4) To enable the skill of ion selective electrode and its applications.
Environmental chemical analysis and control Paper -XII	<p>knowledge domain</p> <ol style="list-style-type: none"> 1) To acquire the knowledge of sampling . 2) To understand the various method of environmental analysis . 3) To acquire the knowledge of pollutant. 4) To understand the concept of organic pollutant and method of its preparation.
	<p>Skill Domain</p> <ol style="list-style-type: none"> 1) To develop the skill of sampling in analysis . 2) To enable the skill of electrochemical and spectral method . 3) To enable the skill of different method of analysis in air and water pollutants. 4) To develop the skill of analysis of organic pollutants.

B) COC/ Life Long Learning and Extension Education:

B. Sc. Part III- Introduction to Medicinal and Essential plants	<p>Knowledge Domain:</p> <ol style="list-style-type: none"> 1.To learn about locally available valuable medicinal and essential plants and its commercial approach 2. To learn conservation and cultivation of medicinal and essential plants and its pharmacognostic study. 3. To learn and adopt practically modern techniques like tissue culture, green house technology, nursery, Harding etc. for conservation of medicinal aromatic plants. <p>Skill Domain:</p> <ol style="list-style-type: none"> 1. To learn analytical techniques for the determination purity of marketed samples. 2.To learn analysis of crude drugs of medicinal plants 3. To enable the learners to run self business like extraction of essential oils or obtain jobs in similar companies.
--	---

Head
Department of Chemistry